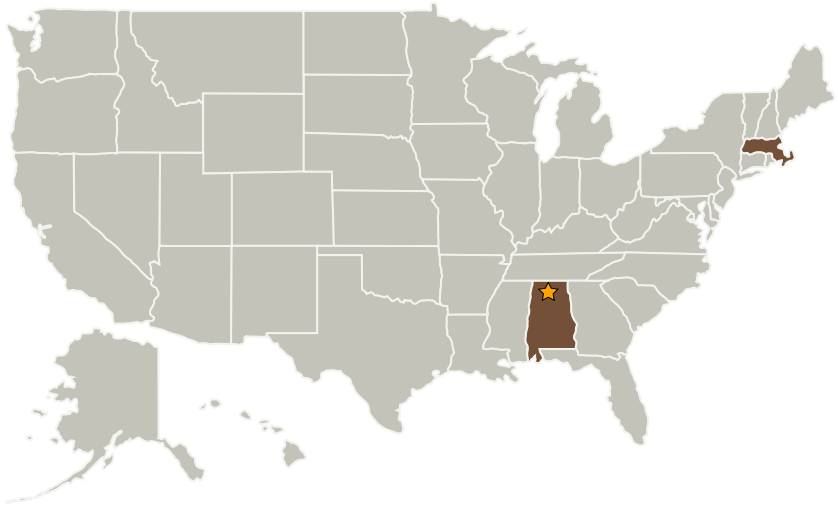
# Materials for advancement of MXER tether design (1000-371), Phase I

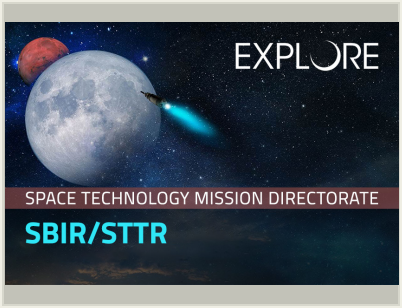
Completed Technology Project (2004 - 2004)

## Project Introduction

There exist a need to develop, identify, and classify various materials that can be used in the fabrication of electrodynamic tethers for various applications. These applications consist of but not limited to power generation, orbital maneuvering, and planetary exploration. A momentum exchange (MXER) tethers utilizes the electrodynamic tether interaction with the planetary magnetic field to provide thrust to a payload in Low Earth Orbit (LEO). While technological challenges, both materials and non-materials related, currently limit the utilization of the MXER concept, significant advances in materials science will allow the maturation of the system into a viable technology for propulsion in and beyond LEO. Tether materials-related advances are primary for improving the operation and lifetime of the propulsion system. Critical materials properties in need of improvement include increases in tensile strength, electrical conductivity, shock resistance, continued flexibility during exposure to an environment rich in radiation and energetic atomic oxygen. Furthermore, the tether design must incorporate materials with the required characteristics in a manner to allow tolerance to repeated micrometeorite impacts without significant loss of the aforementioned properties. Decreases in density and cost per unit length are also required to achieve viability.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Marshall Space Flight Center (MSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

**Small Business Innovation Research/Small Business Tech Transfer**

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Marshall Space Flight Center(MSFC) | Lead Organization | NASA Center | Huntsville, Alabama |
| Triton Systems Inc. | Supporting Organization | Industry | Chelmsford, Massachusetts |

| Primary U.S. Work Locations | |
|---|---|
| Alabama | Massachusetts |

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Bob Mojazza

## Technology Areas

**Primary:**

- TX01 Propulsion Systems
  - TX01.4 Advanced Propulsion
    - TX01.4.2 Electromagnetic Tethers